and girth butt welds must meet the following:

(1) Butt welds of pipes made from carbon, carbon manganese, or low alloy steels must meet §56.50–105 of this chapter, including the requirements for post-weld heat treatment.

(2) Except for piping inside an independent cargo tank type A, B, or C, butt welds must be 100% radiographically tested if the design temperature is lower than −10 °C (14 °F), and:

(i) The wall thickness is greater than 10 mm (0.394 in.); or

(ii) The nominal pipe diameter is greater than 100 mm (nominal 4 in.).

(3) If Table 4 references this section, butt welds for deck cargo piping exceeding 75 mm (3 in.) in diameter must be 100% radiographically tested.

(4) Butt welds of pipes not meeting paragraph (b)(2) or (b)(3) of this section must meet the non-destructive testing requirements under Subpart 56.95 of this chapter.

§154.665 Welding procedures.

Welding procedure tests for cargo tanks for a design temperature colder than 0 °C (32 °F), process pressure vessels, and piping must meet §54.05–15 and Subpart 57.03 of this chapter.

CARGO PRESSURE AND TEMPERATURE CONTROL

§154.701 Cargo pressure and temperature control: General.

Except as allowed under §154.703, cargo tanks must:

(a) Have their safety relief valves set at a pressure equal to or greater than the vapor pressure of the cargo at 45 °C (113 °F) but not greater than the MARVS under §154.405; or

(b) Be refrigerated by a system meeting §154.702, and each refrigerated incompatible cargo refrigerated by a separate system.

§154.702 Refrigerated carriage.

(a) Each refrigeration system must:

(1) Have enough capacity to maintain the cargo vapor pressure in each cargo tank served by the system below the set pressure of the relief valves under ambient temperatures of 45 °C (113 °F) still air and 32 °C (89.6 °F) still water with the largest unit in the system inoperative; or

(2) Have a standby unit with a capacity at least equal to the capacity of the largest refrigeration unit in the system.

(b) For the purpose of this section, a ''refrigeration unit'' includes a compressor and its motors and controls.

(c) Each refrigeration system must:

(1) Have a heat exchanger with an excess capacity of 25 percent of the required capacity; or

(2) A standby heat exchanger.

(d) Where cooling water is used in a refrigeration system:

(1) The cooling water pump or pumps must be used exclusively for the system;

(2) Each pump must have suction lines from sea chests on the port and starboard sides of the vessel; and

(3) There must be a standby pump, that may be used for:

(i) Non-essential purposes on the vessel; or

(ii) Essential purposes on the vessel, if the pump is sized to simultaneously provide for the capacity requirements for the essential purposes and the refrigeration cooling water.

(e) Each refrigeration system must use refrigerants that are compatible with the cargo and, for cascade units, with each other.

(f) The pressure of the heat transfer fluid in each cooling coil in a tank must be greater than the pressure of the cargo.

§154.703 Methane (LNG).

Unless a cargo tank carrying methane (LNG) can withstand the pressure build up due to boil-off for 21 days, the pressure in the cargo tank must be maintained below the set pressure of the safety relief valve for at least 21 days by:

(a) A refrigeration system that meets §154.702;

(b) A waste heat or catalytic furnace that burns boil-off gas, and:

(1) Maintains the stack exhaust temperature below 535 °C (995 °F);

(2) Exhibits no visible flame; and

(3) Is specially approved by the Commandant (G–MSO);